

How Bees Make Honey

A Reading A-Z Level U Leveled Book
Word Count: 1,114

LEVELED BOOK • U

Connections

Writing and Art

Create a graphic using words and pictures that explains each step a colony of bees goes through to produce honey.

Science

Why are bees an important part of the environment? How can people help protect the bee population? Write an essay to share with your class.

How Bees Make Honey

 Reading A-Z

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Written by Lorraine Freenev

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Focus Question

How does a colony of bees work together to produce honey?

Words to Know

| | |
|-------------|---------------|
| abdomens | fertilization |
| capped | foragers |
| cooperation | glands |
| critical | nurture |
| digesting | pollen |
| evaporates | substance |

Cover: Honeybees fill cells of a honeycomb with nectar.

Title page: Two honeybees visit a flower while looking for nectar.

Page 3: Honeybees form chains with their bodies in order to repair a damaged honeycomb.

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Correlation

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Amazing Honey

Honey is one of the most useful and delicious of all foods. You can spread it on bread, pour it in tea, and sweeten cakes and cookies with it. Honey is an important food source for many animals, including bears, raccoons, skunks, and opossums. Humans



People eat honey with many kinds of foods.

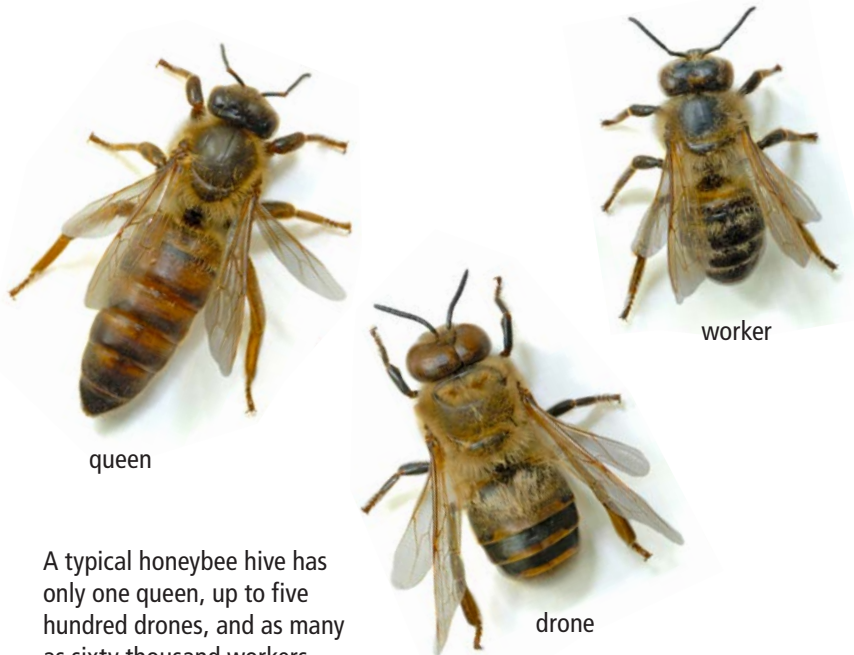
have been big fans of honey for at least nine thousand years. Ancient Egyptians even used honey to preserve mummies!

Of course, bees aren't making honey in order to benefit other species. Bees produce honey to feed their young. They also need it to have a guaranteed source of food during cold winter months when they can't find flowers. Honey is **critical** to their survival.

Maybe you've heard that honey is bee vomit or bee poop. Wrong on both counts! Bees make honey through an extraordinary process that involves much hard work and **cooperation** between all the hive's members.

Types of Honeybees

Honeybee hives are home to three types of bees: workers (female), drones (male), and queens. The queen's role is to lay eggs—as many as two thousand a day. The drones' main purpose is to mate with the queen. Worker bees have different jobs, depending on their stage of development. For the first half of her life, a worker bee usually lives inside the hive. During that time, she has various jobs, including nurse, guard, and attendant to the queen. Older worker bees become **foragers**, gathering nectar and **pollen** from flowers. Without nectar—a sweet **substance** made of sugar and water—there can be no honey.



A typical honeybee hive has only one queen, up to five hundred drones, and as many as sixty thousand workers.

Foraging

Worker bees usually travel within 2 kilometers (1.25 mi.) of their hive to find nectar. However, they may fly two or even three times that far if need be. A bee sucks up nectar from a blossom using her long, pointed tongue, or proboscis.



A honeybee sucks nectar from a plant.

This mouthpart is hollow, like a straw. A honeybee has two stomachs. The nectar is collected in a special honey stomach, also known as a crop. This is a different stomach from the one used for **digesting** food. A bee can carry close to her own weight in nectar in her honey stomach.

Do You Know?

A hive of bees must fly almost 90,000 kilometers (55,000 mi.) and visit two million flowers to produce a pound of honey. One bee colony can produce 27 to 45 kilograms (60–100 lb.) of honey per year. Some other insects, including bumblebees, make honey or a honey-like substance, but they do not store it in large quantities the way honeybees do. One honeybee produces about 0.4 milliliters (1/12th of a teaspoon) of honey in her lifetime.



A honeybee covered with pollen from other flowers spreads it to an African daisy.

Bees don't just collect nectar as they travel from flower to flower. Every time a bee lands on a flower, a little bit of pollen sticks to her feet. As she flies from blossom to blossom, she transfers pollen between the male and female parts of the flower. (Some pollen may also fall from bees as they fly and be transported to flowers by wind.) This transfer of pollen, called *pollination*, allows **fertilization** to take place so that plants can produce fruit and seeds. Thirty percent of the foods we eat—blueberries, strawberries, apples, beans, lettuce, onions, and more—are pollinated by bees.

Pollen is also an essential part of a honeybee's diet. Some honeybees gather pollen instead of, or in addition to, nectar. They collect it in special body parts on their legs. Then they bring it back to the hive to share with other bees.



A forager honeybee passes nectar from her stomach to the mouth of a waiting house bee.

Passing the Nectar

While forager bees fly around looking for flowers, the nectar in their honey stomach mixes with chemicals called *enzymes*. These chemicals begin the process of transforming the nectar into honey. A forager bee may need to visit up to five hundred flowers to fill her honey stomach.

When it's finally full, she returns to the hive. There, another worker bee—known as a house bee or a processor bee—is waiting. The forager bee regurgitates, or spits up, the nectar solution into the processor bee's mouth.



A group of processor bees pass nectar from mouth to mouth to help change it into honey.

While the forager bees return to hunting for nectar, the processor bees continue their work. They pass the liquid from one bee to another, adding more enzymes each time. These enzymes break down the complex sugars in the solution into two simpler sugars, chemically changing nectar into honey. Repeated contact with warm air in the hive during the regurgitation process **evaporates** some of the water in the honey.

Happy Dance!

If a forager bee has discovered a good source of nectar on her travels, she lets the other bees know. By performing a dance composed of waggles, runs, turns, and other movements, she communicates the location of the food source.



(Left) A honeybee prepares to put a drop of nectar into a honeycomb cell. (Right) A honeybee fills a honeycomb cell with nectar.



Drying the Honey

After about half an hour of being passed back and forth, the nectar is ready to go in the honeycomb. Each cell in a honeycomb is a perfect hexagon (a shape with six sides of equal length) made of beeswax. Bees create beeswax in **glands** on their **abdomens**. The beeswax comes out of their body in thin sheets called *scales*. Hexagonal cells use the least amount of beeswax to make the strongest, most compact honeycomb possible.

Bees spread out the nectar solution in the cell so water can continue to evaporate. Additionally, bees help thicken the liquid even more by fanning it with their wings at top speed. As the air moves around the cell, more moisture evaporates.



A group of worker bees cap off filled honeycomb cells.

Capping the Cells

Once enough water has evaporated and the honey is the correct thickness, it is ready to be **capped**.

Bees use beeswax to cap the filled honeycomb cells to keep them clean and airtight. The honey is now ready to be stored until it's needed in winter—or harvested for humans (or other animals) to enjoy.

Wowser!

How long can sealed honey stay fresh? While excavating Egypt's famous pyramids, archaeologists found pots of honey in an ancient tomb. The honey, which dates back approximately three thousand years, is the world's oldest sample. It was preserved—and still edible!

This drawing of a bee was found in an Egyptian tomb.



Honey can look and taste very different, depending on the kinds of flowers the bees visited to make it.

Types of Honey

The flavor, color, and thickness of honey can vary, depending on the type of flower a bee harvests nectar from. Different flavors of honey are popular in different countries. Lavender honey is often consumed in France, while wild thyme honey is commonly eaten in Greece. In the United States, clovers contribute more to honey production than any other group of plants.

Because honey contains so little water, has a high sugar content, and is slightly acidic, bacteria and other germs cannot grow in it. When mixed with water, honey produces hydrogen peroxide, a chemical that kills germs. This makes honey useful in treating wounds. Manuka honey, produced primarily in New Zealand, is better for treating wounds than other kinds of honey because of a special chemical found in the nectar of manuka flowers.

Helping Bees

Bees work so hard to make honey—foraging and processing the nectar and then drying and storing the honey—because they need its nutrients to survive. Though humans have found many uses for this sweet treat, we don't rely on it the way honeybees do. However, we do need bees to help pollinate much of the food we eat and the crops that feed other animals.



Eighty-five percent of the world's almonds are grown in California. The almond orchards there need 1.7 million hives of bees to pollinate them each year.



Bees stop for a drink at a water dish left out for them in a hot, dry climate.

We can help honeybees by planting bee-friendly flowers; bees especially love wildflowers and native plants. We can also help them by using fewer chemicals to kill bugs and weeds, many of which can harm bees. When possible, buy honey from local beekeepers who **nurture** their bees. Even putting out a saucer of water in summertime, with a stone or pebble for bees to stand on, can help thirsty worker bees that need a water break.

By protecting bees and their environment, we can help them keep making delicious honey—for them and for us!

More Than Honey

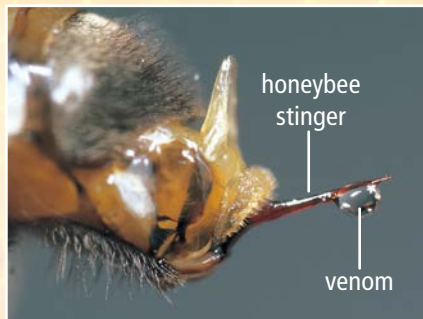
Humans also use these other bee products:

Beeswax—the substance used to form honeycombs and cap cells—has many uses. Historically, it has been used to make candles and cosmetics, in sealing wax, in making bows for archery, and to strengthen sewing thread and shoelaces, among other uses.



Royal jelly is used in some cosmetics and as a dietary supplement and medicine, though its benefits for humans have not been proven. It is produced by worker bees and fed to all larvae in the honeybee colony for the first three days of life.

Bee venom is what makes bee stings hurt. It's used to help with certain medical problems, such as arthritis.



Glossary

- abdomens** (*n.*) back parts of insect bodies, which contain the reproductive and digestive organs (p. 10)
- capped** (*v.*) covered or limited something (p. 11)
- cooperation** (*n.*) the act of working together toward a shared goal (p. 4)
- critical** (*adj.*) very important (p. 4)
- digesting** (*v.*) processing food in the body and turning it into energy (p. 6)
- evaporates** (*v.*) changes from a liquid to a gas (p. 9)
- fertilization** (*n.*) the process of combining male and female cells to create a new animal or plant (p. 7)
- foragers** (*n.*) people or other animals that search for and gather food or other needed things (p. 5)
- glands** (*n.*) organs that make and give off substances that are necessary for body processes (p. 10)
- nurture** (*v.*) to give care and nourishment to a living thing in order to help it develop and grow (p. 14)
- pollen** (*n.*) male flower cells, which often look like fine yellow powder (p. 5)
- substance** (*n.*) a particular kind of physical material (p. 5)